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Florin Paun

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"Demand Readiness Level" (DRL), a new tool to hybridize Market Pull and Technology Push approaches

Introspective analysis of the new trends in Technology Transfer practices

Florin Paun, Onera-The French Aerospace Lab, Chatillon, France
Economiste, expert invité et membre du Laboratoire de recherche sur l'Industrie et l'Innovation

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Abstract

Analyzing the evolution of the innovation models, from the linear process ("concept" for Schumpeter, "R&D push" for Abernathy, Utterback, "co-innovation" for Shapiro), integrated and systemic process ("coordination process" for Hardy, Iansiti, Chen, "innovative management" for Tucker) to total innovation management (3 totalities for XU) we could understand the evolution of the practices and actors of innovation. This paper identifies the importance of new tools in order to favor the technology transfer process. The author introduces the concept of "Demand Readiness Level", an additional scale to Technology Readiness Level, which will relate to the degree of maturity for the expression of a need by a customer on a given market including the lead markets for eco-innovation. The case of SMEs it will be in particularly addressed with the identification of specific "asymmetries in the innovation process" (Paun, F., 2009): risk asymmetry, cultural asymmetry and technology asymmetry.

Introduction to TTO practices

The main activities of the Technology Transfer Offices are related to Technology Push approaches. An important number of these offices either integrate or collaborate closely with business incubators ready to support start-up activities. The main discussions and interests of both Technology Transfer executives and economists trying to conceptualize the innovation practices (e.g. AUTM or T2S Annual Meeting) are also related to how to commercialize R&D results for the benefit of industrial partners. Detecting, promoting, identifying prospects and licensing are considered business as usual by all the TT officers.
Indeed, all these considerations are focused on some central questions: how do I fit what my R&D colleagues developed into the market? How to find the appropriate market injection vector? Is it an industrial group, an SME or do I need to support my R&D colleagues in their attempting to create a successful start-up?
Another important issue to be solved by the TT Officers is how to evaluate and negotiate with the industrial partner in order to recognize together the value of the transferred IP. How big the market will be? How big is the interest of the industrial partner I found on the market?
All these questions are carrying their answers inside what economists called Information Asymmetry (Stiglitz) and thus increase the risk of failure for an appropriate Technology transfer deal because of uncertainty and lack of appropriate comprehension tools for the innovation process. Recent economic works suggest that other important asymmetries in addition to the above mentioned are highly influencing the quality of the deal while performing Technology Transfer; the Cultural Asymmetry between entrepreneur and researcher, the Financial Risk Asymmetry and the Technological Capability Asymmetry.

Current issues

All of these, induce a generally acknowledgment inside TTO community that excepting the "lucky blockbusters" or some of the "big names" the Technology Transfer Offices are not financially beneficial. Important discussions where carried out between TT executives informally at the AUTM and T2S last

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meetings related to the Industrial Groups roaring on Universities "expensive" IP rights and their newly engaged R&D activities with emerging countries Universities.
Professor Chris Hill from George Mason University gave a memorable talk, related to this question, at the 2010 T2S Annual Meeting, with the occasion of his Keynote Lecture. He gave a significant and unanimous acknowledge pledge on the importance to introduce the Technology Transfer activities inside the Core Activities expected from an University and thus accepting the fact that this activity has not necessary to be beneficial while inducing economic value in the region.
Following his lecture, Florin Paun publicly suggested, based on his experience at Onera and further to his economic research works on innovation actors' asymmetries and "hybridisation tendency of the innovation system", that as one of the Core Expectations from an University is to induce economic value in the region, not only the Technology Transfer activity must be recognized like one of the Core Activities of the University (as he just suggested) but also it must be reshaped from a Technology Push priority to an appropriate "equilibrium between Technology Push and Market Pull trough a hybridized approach": *"We need to change our jobs from "Look how nice is my technology baby" to "I'm here to listen to you, to co-conceive solutions and to support you with my knowledge in your technology development project". TTO actually tend to identify the need to take more into consideration the technology needs of the regional SMEs without replacing their complementary technology push activities"*

*(*Note: This intervention was also publicly acknowledged and encouraged for publication by the community. These 3 pages are the result of these suggestions to share this specific hybridized approach with the TT community. PhD Florin Paun experience is based, as Deputy Director in charge with Industrial Innovation, on a 5-year relationship between 2006 and 2010, with more then 80 SME partners, on the drivers and barriers perceived inside this relationship and on more then 40 interviews with scientists and industrial representatives involved in direct collaborations linked to technology or knowledge transfer.)

Onera's Technology Transfer Experience

Starting with 2005, Onera adopted a voluntary strategy towards SMEs. It was based on the assumption made that the SMEs are the most adapted vectors for technology demonstration out of the aerospace domain. The experience proved that the straight Technology Push approach was not the most appropriate to put our newly developed technologies on different other market domains. ONERA needed to adapt our relationship on a win-win basis.
Onera starts to promote not its newly developed technologies but its competencies. It conceived, promoted and signed in 2007 with more then 40 SME, at that time, an ONERA-SME collaboration Charter. This Charter, signed by more then 80 partners nowadays, is based on well defined and agreed role between the parties. The SME cluster around Onera became "eyes and ears" on the Market for the perceived technological needs while Onera became knowledge provider to the SMEs for their innovative development projects;… and it works.
Previously to this new orientation, ONERA signed about one technology transfer agreement each 2 years in technology push. We signed about 10 per year during last 2 years, 8 induced by Market Pull approach and 2 by Technology Push. This multiplication effect on the Technology Push deal flow was rather unexpected. But, with the experience ONERA got and by institutionalizing its approach (with internal and external recognition), this positive demultiplication effect turned to recognize that the better comprehension and understanding between ONERA scientists and the industrial representatives was partial obtained also trough their previously carried Market Pull innovation projects.
The fundamental generally observed fact on each of the technology transfer agreement signed was that none of the obtained deals could be classified in a pure Technology Push or Market Pull approach. Indeed, all the agreements were obtained around a particularly given moment when a Technology Push approach meat an existing Market Pull approach made in parallel by the industrial partner.
We have hardly tried to identify and well define the conditions making feasible a license agreement deal; conditions aimed to predict the particularly given moment for the junction of the two types of approaches. We thus tried to understand and arrange these conditions by relating them to specific processes perception while referring at the TRLs scale. Something was missing and it didn't work. We could not identify generally valid conditions or definitions and we accepted this particularity of adapted solutions "any time is case by case" different from the standardized approach of TRLs

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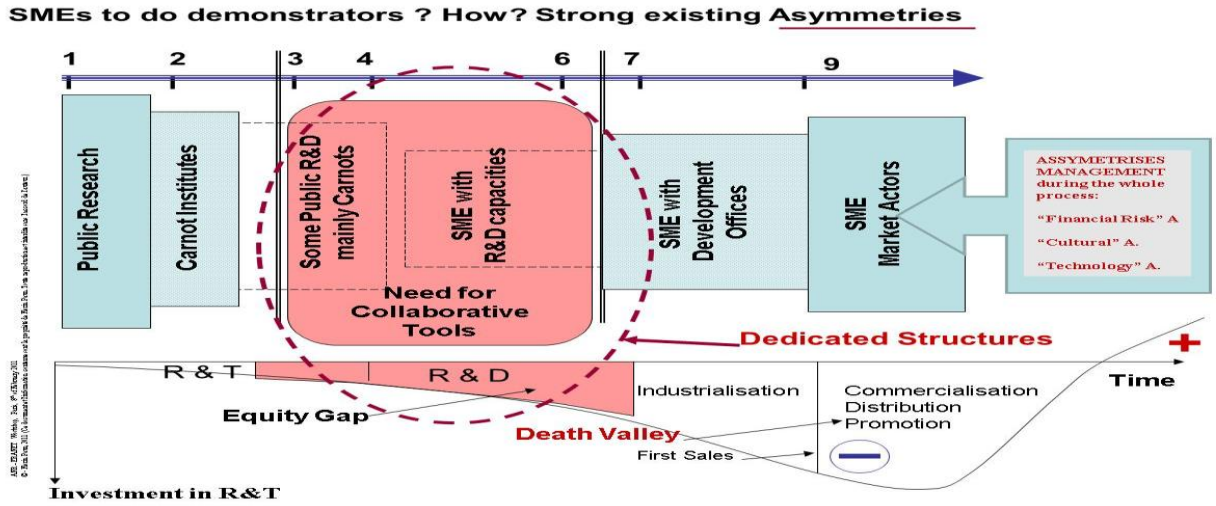

Introduction of a new concept for understanding and measuring the Market Pull approach :
We observed that the innovation process was subordinated to the reference adopted system. Indeed, all the actors involved in Technology Transfer process have their attention "glued" to the TRL scale. In practice, even speaking about the Customer Voice we still ask (or are asked) about "what is the TRL level" for the appropriate technology sensed to tackle the Expressed Need by an industrial who's addressing our R&D Commercialization Office.

Why continuing to refuse the evidence? : Even the Customer Voice is sunk inside the TRL scale and our minds are thus Technology Push driven. Why not referring from now on, when facing an industrial expressing to the R&D Commercialization Office to a new scale related this time to what we call the **Demand Readiness Level (DLR)** identified by a customer on a given market?
It actually means that it is the right timing to define an additional scale and plot it in a reverse manner related to the classic TRL scale in order to have the appropriate comprehension of the Market pull process. The author is proposing this schematic further for a better comprehension.

DMEN Level	**"Demand Readiness Level" (Paun, F., 2011)**	**Description Technology Readiness Level**	**TRL Level**
1	Occurrence of a Feeling "something is missing"	Market certification and sales authorisation	9
2	Identification of a specific need	Product Industrialisation	8
3	Identification of the expected functionalities for the new Product/Service	Industrial Prototype	7
4	Quantification of the expected functionalities	Field demonstration for the whole system	6
5	Identification of the systemic capabilities (including the project leadership)	Technology development	5
6	Translation of the expected functionalities into needed capabilities to build the response	Laboratory demonstration	4
7	Definition of the necessary and sufficient competencies and resources	Research to prove feasibility	3
8	Identification of the Experts possessing the competencies	Applied research	2
9	Building the adapted answer to the expressed need on the market	Fundamental research	1

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Source: (Paun. F., 2011) ***Demand Readiness Level*** *as equilibrium tool for the hybridization between Technology Push et Market Pull approaches: ANR - ERANET Workshop, 8th of February 2011, Paris*

For example, if an industrial partner has a DRL on 8, he will be able to identify and speak with the appropriate scientist to launch a collaborative R&D program for developing a new product or service. Some type of matching between different levels could be observed at each line of the previous table.
This is now better understood why "each case is a specific one". Looking in two references systems, one for the Technology Push approach and the other one for the Market Pull approach, we could predict the given particularly timing when an technology transfer agreement is ready for signature. Further research are on the process to Postulate that the Technology Transfer Agreements between R&D laboratories and Industrials are only possible if the sum DLR+TRL is at least equal to 10.

The "**Demand Readiness Level"** is a new measure to assess the maturity of evolving demands identified by potential innovation actors towards an appropriate stage of conceptualisation of the need in the market allowing a matching point with scientific research teams capable to either propose as solution an existing scientific result through technology transfer process or translate the demand in new R&D projects.

In the context of the sustainable development, the DRL offers also the opportunity to oriente part of the research and innovation investments towards sustainable solutions as the DEMAND integrates ex ante the newly regulations concerning compatibility with environmental and social values. Thus, the sustainability effect on R&D projects through their valorisation by DRL could place this new tool as levier for generalizing eco-innovation in the "**Hybridization**" strategy of Technology Push and Market Pull approaches (Paun, F, 2010).

Conclusion

Since many years the TRL scale allowed various analysis of the technology transfer and technological innovation processes by positioning the various stakeholders along this scale. TRL scale allowed the identification of various asymmetries between the actors and thus suggested the introduction of various reduction or compensation tools at Onera (and not only). Trough this contribution, we proposed a new reference system for better addressing the Market Pull approach while doing technology transfer and technological innovation. The DLR scale could also be the object of the same dynamic exchanges and analysis that the TRL scale induced among the academics or practitioners communities. The aim is that this new tools for a hybridized approach will significantly improve the innovation and TT practices trough a better understanding of the different factors and staging allowing the agreements signatures to creating value. For a TT Officer or a Strategy Industrial Director will be important to survey the matching of the levels on the 2 scales while placing the participating actors, identifying the existing asymmetries between them and activate compensation or reduction tools for dealing with these asymmetries. When the sum of the 2 indicators will equalize 10 the deal between the Industrial and the R&D laboratory becomes feasible and will interest all the stakeholders of the innovation project, including the investors (private or public).With a better understanding and control of the hybridization strategy between Technology Push and Market Pull approaches the innovation system tends to evolve towards a better compatibility with the social and environmental requirements inevitably market pull driven as in the case of eco-innovation.

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